

DEVELOPING PROPOSED KEY NURSING PERFORMANCE INDICATORS AT INTENSIVE CARE UNITS OF THE NATIONAL HEART INSTITUTE

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Abstract

Background: Intensive care nursing requires continuous surveillance, complex procedures, rapid recognition of deterioration, infection prevention, accurate documentation, communication, and timely intervention. Contemporary literature has emphasized the need for clearly defined and context-specific nursing-sensitive indicators that can represent nursing processes and outcomes more comprehensively. **Aim:** This study aimed to develop proposed Key Nursing Performance Indicators (KNPIs) for intensive care units at the National Heart Institute. Design: A methodological design was utilized. **Setting:** The study was conducted at the National Heart Institute, Cairo, Egypt. **Sample:** A convenient sample of 70 nurses working in selected intensive care units was included. Three observations were conducted for each nurse, resulting in 210 observations. **Tools:** Data were collected using a personal and work-related data form, a nursing staff perception regarding key nursing performance indicators, an observational KPI checklist, and an expert opinionnaire for face and content validity of the proposed indicators. **Results:** The largest proportion of nurses were aged 30 to less than 45 years (45.7%), female (77.1%), married (82.9%), and holders of a technical nursing diploma (58.6%). Most nurses had substantial clinical experience; however, 100% reported no previous training in quality performance and management. Several clinical process indicators improved markedly across repeated observations. DVT prophylaxis increased from 17.1% to 100% ($\chi^2=21.32$, $p<0.001$), daily oral care with chlorhexidine increased from 34.3% to 100% ($\chi^2=11.67$, $p=0.001$), arterial-line fluid-balance monitoring increased from 17.1% to 100% ($\chi^2=8.82$, $p=0.003$), and the proposed Key Nursing Performance Indicators (KNPIs) for Intensive Care Units (ICUs). The findings revealed an exceptionally high level of agreement among the 15 experts, with an overall agreement rate of 100% for all items and no reported disagreement. **Conclusion:** The observational findings demonstrated **variable levels of compliance across different nursing-care domains. Ventilator-bundle compliance** improved across observations, with statistically significant improvements in DVT prophylaxis and daily oral care. Finally, the expert opinionnaire demonstrated 100% overall agreement regarding the proposed Key Nursing Performance Indicators, supporting their relevance, applicability, clarity, understandability, and representation of the study dimensions. **Recommendations:** adopt developed a standardized Key Nursing Performance Indicator system for ICU nursing practice and Integrate the proposed KNPIs into the hospital's quality-management system and ensure that they are clearly communicated to all ICU nursing staff..

Keywords: Key Nursing Performance Indicators, Nursing Performance, ICU.

INTRODUCTION

Intensive care units are complex clinical environments in which nurses provide continuous assessment, surveillance, coordination, and intervention for patients with life-threatening conditions. The quality of ICU nursing therefore depends not only on whether individual procedures are completed, but also on whether organizational structures, staffing, resources, clinical processes, documentation, communication, and patient-centered outcomes are systematically monitored. Recent literature has emphasized that existing approaches to evaluating nursing care remain fragmented and may not adequately capture the full contribution of nurses to patient care. (Gormley, Connolly, & Ryder, 2024).

Nursing-sensitive indicators are increasingly important because they provide measurable information about aspects of care that are influenced by nursing practice. However, contemporary discussion has identified inconsistencies in the definitions and application of nursing-sensitive indicators and has called for evidence-based indicators that are relevant to the actual nursing role and care context. This need is particularly important in critical care, where nursing actions occur continuously and where omissions in surveillance, infection prevention, documentation, escalation, and procedure-related care may have important consequences. (Gormley et al., 2024; McEvoy, Kalvas, Walsh, & Curley, 2025). In ICU settings, nursing performance is also closely related to workload, staffing, and the complexity of patient care. A recent systematic review and meta-analysis demonstrated that ICU nursing workload remains an important quality and workforce issue and supported the value of structured workload measurement. Thus, staffing-related KPIs should consider patient acuity and workload rather than relying solely on a fixed nurse-to-patient ratio. (Li, Zou, & Chen, 2025). Clinical process indicators are particularly relevant to ICU nursing because they can be observed directly and can provide early information about the quality of care before patient outcomes become apparent. Ventilator care bundles, for example, include practices such as head-of-bed elevation and oral care. Recent systematic evidence found that implementation of ventilator bundles was associated with reduced VAP and shorter mechanical ventilation and hospital stay, particularly when educational activities were incorporated. (Martinez-Reviejo et al., 2023; Thapa, Liu, & Chair, 2023).

Similarly, central-line care requires consistent adherence to infection-prevention and maintenance practices. A 2025 systematic review found that education, leadership support, auditing, and feedback can improve nurses' adherence to CLABSI prevention bundles. These findings support the inclusion of both technical and management-oriented central-line indicators in ICU nursing KPI systems. (Bou Hamdan, Hatahet, Khalil, & Yousef, 2025). Patient safety and patient experience are also important dimensions of nursing performance. Recent evidence indicates that ICU nurses perceive important strengths in teamwork and continuous learning but continuing weaknesses in staffing adequacy and nonpunitive responses to errors. In addition, recent work on ICU patient experience has emphasized the importance of using valid measures to capture patients' perspectives of critical care quality. (Chen et al., 2025; Tao et al., 2025). Accordingly, the development of locally relevant KNPIs may provide nursing administration with a practical

mechanism for translating standards into measurable bedside performance, identifying gaps, providing feedback, and supporting continuous quality improvement. The present study used Donabedian's structure–process–outcome framework because it allows nursing performance to be examined at the level of resources and organizational conditions, actual care processes, and subsequent outcomes.

Significance of the Study

The National Heart Institute provides care for patients with complex cardiac and critical conditions in multiple intensive care settings. The study was considered important because a comprehensive KPI system can make nursing performance more visible, provide common standards for auditing, identify areas requiring educational support, and establish a foundation for linking nursing processes with patient-safety and patient-experience outcomes. That need for more comprehensive nursing-sensitive measurement systems that can translate indicator data into quality-management decisions. (Gormley et al., 2024; Barrenetxea et al., 2025).

SUBJECTS AND METHODS

Aim of Study

The present study aimed to develop proposed Key Nursing Performance Indicators at intensive care units of the National Heart Institute.

Research Objectives

- Assess the current nursing PERCEPTION ABOUT KEY NURSING PERFORMANCE INDICATORS in intensive care units at the National Heart Institute.
- Develop the proposed Key Nursing Performance Indicators at ICU.
- Validate and approve the proposed Key Nursing Performance Indicators at ICU.
- Communicate the proposed KPI system locally at the National Heart Institute

Research Design

methodological design was utilized in this study

Setting of the Study

The study was conducted at the National Heart Institute (NHI), affiliated with the General Organization for Teaching Hospitals and Institutes. ICU capacity of 178 beds, including 112 adult ICU beds distributed among medical and surgical critical-care areas. The selected setting includes adult intensive care areas serving patients with complex cardiac and critical conditions.

Study Sample

The samples were included in the study 70 from total 120 staff nurses from all units represented in studied sample

Validity sample: (15) Nursing Administration Expert's from academic and serves organization to elicit their opinion regarding face and content validity of the proposed KPI.

Data Collection Tools

To achieve the aim of this study, data was collected by using the following for tools

- **First Tool: Personal Characteristics Data Sheet:** It was developed by the investigator and include such items of the studied participants nurse as; age, gender, current position job title, educational qualification, years of experience, and attendance of any previous training programs about KPI
- **Second Tool: Nursing Staff Perception Regarding Key Nursing Performance Indicators:** It was designed by the Investigator after reviewing extensive literature to assess the presence of key nursing performance indicators, Availability Of documents related key nursing performance indicators Such as (Mission, Vision, Objectives, Core Values, Policies, Procedures, Protocols, Job Descriptions and Measurements) The questioner was checked by the nursing staff in each unit in the selected hospital composed of (20) questions.
- **Third Tool: Observational Check List of Staff Nurses' Performance:** Which divided into two part the first one was developed by investigator; observational check list of nursing staff performance regarding critical care and the second part observational check list of nursing staff performance regarding general care.

A- Observational check list of nursing staff performance regarding critical care Appendix (E). it includes (9) dimensions to collect data relevant to the study, and subdivided into (61) items as follows: ventilator bundle (5 items), oxygen and ventilation (6 items), intravenous line (10 items), arterial line (5 items), vital signs (5 Items), intra-aortic Pallone pump (6 items), central line bundle (5 items), post Oben heart surgery (6 items) and chest tube care (8 items).

Scoring System: Was a 3 points Likert scale, (3) Done, (2) Not Done and, (1) Not Applicable,

- The observation was done for three times for each participant. If done at the three times of observation it would take (3), if it was not done at three time of observation it would take (2), and if it was not applied at three time of observation at would take (1)
- Scoring represents varying levels of compliance of nursing care; cut point 50 %. Low = < 50 %, Moderate = 50 – 75 % and High = > 75 % (Fawzy, 2013, Saleh, 2016).
- **Forth tool: Expertise's opinionnaire sheet (Validity Sheet):** This tool were designed by the investigator for testing face, content and construct validity of the questionnaires and the proposed key nursing performance indicators to elicit expertise jury opinions about the proposed KPI.
- Scoring system: the data were analyzed statistically by number and percentage as the following: (one score) for yes, (zero score) for No.

Validity and Reliability

Tool Validity

Content validity was checked by a three of experts two from nursing administration department at faculty of nursing, Cairo university, and one director of nursing at the general organization for teaching hospitals &institutes (GOTHI) Each expert was asked to evaluate the two data collection tools for their content, clarity, wording format, length, and overall appearance ,minor change were made at first and second tools as rephrasing some items.

Tool Reliability

The Cronbach's Alpha test was done for study tools. The calculated reliability was (0.891) for self-administering questionnaire, the calculated reliability was high which reflect high internal consistency within the acceptable limit. As regarding to observational checklist for nursing care it was (0.87) and that was within the accepted limit also.

Procedures

Primary formal approval was obtained from the ethical committee at Faculty at Nursing, Cairo University and then from the Vice Dean of post graduate studies and research at the faculty of nursing, Cairo university. Also, an official permission was obtained from the ethical committee of the general organization for teaching hospitals &institutes (GOTHI).and Dean of National Heart Institute. The researcher explained the aim, nature and significance of the study for every eligible nurse staff to obtain their acceptance to participate in the study. Then, the researcher obtained their acceptance in a written form. The researcher collected data through the five phases of (Donabedian theory, 1980).

Preliminary phase: After explanation of the aim and the objective of the study official administration permission was obtained from National Heart Institute. After obtained the administration approved letter the researcher met the health team member to explain the purpose and impotence of the study.

Assessment Phase: The researcher was getting a list of Nurses numbers at intensive care unit (ICU) to identify personal data and work-related personal data and distribution in work setting. Then the researcher was distributed the questioner and work related data on nursing staff.

Moreover, quality of nursing care for staff nurses was measured by the researcher using the quality of nursing care observational checklist for general and critical care, also every nurse was observed three different times using intermittent observation (70 nurse × 3 intermittent observations) with total 210 observations. Intermittent Observation was applied at day and night shift. In different time, data collection procedure extended six months from October 2023 March, 2024.

Planning Phase: Based on the results of initial assessment and the knowledge obtained from the literature review, the proposed key nursing performance indicator developed.

Validation And Approval Phases: The proposed key nursing performance indicators was reviewed by the fifteen (15) expert's professor, as following two professors, from in nursing administration department, and two professors from medical and surgical nursing department and one professor from critical care nursing department faculty of nursing, Cairo University, and one professor from faculty of nursing Ain Shams University, one professor from ministry of health. And eight experts from stakeholder as quality, infection control, training and nursing administration at both of NHI and (GOTHI). Approval of the proposed and validated key nursing performance indicator was obtained from directors (medical and nursing) of NHI.

Communication Phase: the approved key nursing performance indicator were communicated to mangers of quality and infection control department and all unit manager of ICUs.

Ethical Consideration

Before data collection, an official permission to conduct the proposed study was obtained from ethical committee at Faculty of Nursing, Cairo University to carry out the study. Participation in the study was voluntary and based on the nurse's ability to give informed consent; where informed consent should be signed by the participants after reading all its details; the ethical issues considerations include explaining the purpose and nature of the study, stating the possibility to withdraw at any time, confidentiality of the information where it was not accessed by any other party without taking the permission of the participants, participation is with no risk. Also, an official permission was obtained from the ethical committee of GOTHI.

Statistical Analysis

Upon completion of data collection the collected data had been coded, scored, tabulated and analyzed by using the "Statistical Package for Social Science" (SPSS) (IBM Corp. 2021), program using version 22. Descriptive statistics such as frequency, percentage distribution, mean score and standard deviation were utilized in analyzing data pretended in this study. Relative statistical tests of significance were used to identify the relationships among the study variables. Threshold of significances is fixed at (P value $\leq$ 0.05).

RESULT

Frequency Distribution of Nursing Staff According to Their Personal Characteristics (N=70)

personal characteristics data	No.	%
Age		
20-<30	16	22.9
30-<45	32	45.7
45+	22	31.4
Marital status		
Single	12	17.1
Married	58	82.9
Gender		

Male	16	22.9
Female	54	77.1
Education in nursing		
Bachelor of Nursing	10	14.3
Technical associate diploma	19	27.1
Technical Diploma	41	58.6
Experience in Nursing		
1-<5	12	17.1
5-<10	3	4.3
10-<15	30	42.9
15+	25	35.7
Year of graduation		
Before 2009	43	61.4
2009-2019	24	34.3
2020+	3	4.3
Place of work(type of ICU)		
Internal medicine ICU	16	22.9
Surgical ICU	17	24.3
Cardiac Cath ICU	12	17.1
Emergency ICU	10	14.3
Heart failure ICU	7	10.0
Peace maker ICU	8	11.4
Experience in current place		
1-<5	3	4.3
5-<10	24	34.3
10-<15	20	28.6
15+	23	32.9
Training in quality performance and management		
No	70	100.0

The table (1) reveals that less than half of the studied nurses (45.7%) were aged from 30 to less than 45 years. Nearly one third (31.4%) were aged 45 years and above, while (22.9%) were between 20 and less than 30 years, concerning marital status, the majority of the studied nurses (82.9%) were married, whereas only (17.1%) were single. Regarding gender, the majority of the studied nurses (77.1%) were females, while males constituted 22.9% of the sample. As regards educational level, more than half of the studied nurses (58.6%) held a Diploma in Nursing. About (27.1%) graduated from a Technical Institute of Nursing, while only 14.3% held a Bachelor's degree in Nursing. In relation to total years of experience in nursing, (42.9%) of the studied nurses had from 10 to less than 15 years of experience, and 35.7% had 15 years or more. Meanwhile, (17.1%) had from 1 to less than 5 years, and only (4.3%) had from 5 to less than 10 years of experience. Concerning year of graduation, more than two third of the studied nurses (61.4%) graduated before 2009. About (34.3%) graduated between 2009 and 2019, whereas only (4.3%) graduated in 2020 or later. As regards place of work, the highest percentage of nurses (24.3%) worked in the surgery department, followed by (22.9%) in the internal department. Additionally, (17.1%) worked in the catheterization unit, (14.3%) in the emergency department, (11.4%) in the heart unit, and (10.0%) in the hypotension unit. Regarding years of experience in the current place of work, (34.3%) of the studied

nurses had from 5 to less than 10 years of experience, and (32.9%) had 15 years or more. Meanwhile, (28.6%) had from 10 to less than 15 years, and only (4.3%) had from 1 to less than 5 years. Finally, the table shows that none of the studied nurses (100%) had received training in quality.

Part 2: Nursing Staff Perception Regarding KPI (N=70)

Items	Yes	No	Yes	No	X2	P
	No.	%	No.	%		
The hospital has clear vision about key performance indicators	34	48.6	36	51.4	0.06	0.811
The objectives of the hospital include key performance indicators	34	48.6	36	51.4	0.06	0.811
The hospital core values involve the key performance indicators	34	48.6	36	51.4	0.06	0.811
The hospital has policies of key performance indicators.	34	48.6	36	51.4	0.06	0.811
The hospital applies the Procedures of key performance indicators.	34	48.6	36	51.4	0.06	0.811
The hospital has announced key performance indicators.	34	48.6	36	51.4	0.06	0.811
The hospital has annual updated key performance indicators.	34	48.6	36	51.4	0.06	0.811
The Nurse- Patient ratio in the ICU 1: 1	12	17.1	58	82.9	30.23	0.000
The Nurse- Patient ratio in the ICU 1: 2	24	34.3	46	65.7	6.91	0.009
The Nurse- Patient ratio in the ICU 1: 3	34	48.6	36	51.4	0.06	0.811
The daily work task and schedule for nurses are clearly assigned.	46	65.7	24	34.3	6.91	0.009*
The daily work task and schedule clearly communicated to the senior officer-in charge.	34	48.6	36	51.4	0.06	0.811
The daily work task and schedule clearly announced to the ablatives board in the unit.	34	48.6	36	51.4	0.06	0.811
The ICU staff trained on using key performance indicators.	34	48.6	36	51.4	0.06	0.811
The regular in-house clinical update trainings & meetings organized for the ICU team.	34	48.6	36	51.4	0.06	0.811
All ICU staff experienced and certified in basic and advanced life support.	34	48.6	36	51.4	0.06	0.811
The incident record book in the ICU unit clearly announced.	34	48.6	36	51.4	0.06	0.811
ICU staff made aware and encouraged to fill in the incidents record book.	34	48.6	36	51.4	0.06	0.811
The patient safety incidents during procedures identified and reported on time.	34	48.6	36	51.4	0.06	0.811
The incident s managed and responded to according to the hospital incidence policy.	34	48.6	36	51.4	0.06	0.811

Table (2) showed that more than half of the studied nurses (51.%) reported the absence of key performance indicators in terms of hospital vision, objectives, core values, policies, procedures, and updating system. The same table illustrated that the majority of nurses (82.9%) disagreed that the nurse–patient ratio in ICU is 1:1. Additionally, about two-thirds of them (65.7%) disagreed regarding the 1:2 ratio. However, no significant difference was found regarding the 1:3 ratio. Moreover, about two-thirds of the nurses (65.7%) agreed that daily work tasks and schedules are clearly assigned.

Table 3: A-1 Observed Nurses' Performance In Compliance With KPI Regarding Ventilator Bundle (N=70) With 210 Observations

Ventilator Bundle	First observation				Second observation				Third observation				X2	P
	Done		Not done		Done		Not done		done		Not done			
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%		
Head of the Bed 30	70	100.0	0	0.0	70	100.0	0	0.0	70	100.0	0	0.0	0.00	1.000
Daily sedative interruption and assessment of readiness to extubate.	58	82.9	12	17.1	58	82.9	12	17.1	70	100.0	0	0.0	1.13	0.289
PUD Prophylaxis	58	82.9	12	17.1	58	82.9	12	17.1	70	100.0	0	0.0	1.13	0.289
DVT Prophylaxis	12	17.1	58	82.9	25	35.7	45	64.3	70	100.0	0	0.0	21.32	0.000*
Daily Oral Care with Chlorhexidine	24	34.3	46	65.7	35	50.0	35	50.0	70	100.0	0	0.0	11.67	0.001*

Table (3: A-1) showed that the highest compliance (100.0%) was observed in head-of-bed elevation across all three observations. While, the lowest compliance (17.1%) was found in DVT prophylaxis during the first observation. There was a marked improvement in compliance of ventilator bundle elements over time, as DVT prophylaxis and daily oral care with chlorhexidine showed statistically significant differences across the three observations ($\chi^2 = 21.32$, $p < 0.001$ and $\chi^2 = 11.67$, $p = 0.001$, respectively). On the other hand, daily sedative interruption and PUD prophylaxis showed improvement to 100.0% in the third observation, but without statistically significant differences ($\chi^2 = 1.13$, $p = 0.289$).

Table 3: A-2 Observed Nurses' Performance In Compliance With KPI Regarding Oxygen and Ventilation (N=70) With 210 Observations

Oxygen and ventilation	First observation				Second observation				Third observation				X2	P
	Done		Not done		done		Not done		done		Not done			
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%		
Patient informed about the reason of oxygen therapy	70	100.0	0	0.0	70	100.0	0	0.0	70	100.0	0	0.0	0.00	1.000
Oxygen therapy was given probably as doctor order	70	100.0	0	0.0	70	100.0	0	0.0	70	100.0	0	0.0	0.00	1.000
Patient was encouraged to cough and take deep breath at designed intervals as needed	58	82.9	12	17.1	58	82.9	12	17.1	70	100.0	0	0.0	1.13	0.289
Assess patients on invasive mechanical ventilation	58	82.9	12	17.1	58	82.9	12	17.1	70	100.0	0	0.0	1.13	0.289
Provide care for endotracheal tube as needed	12	17.1	58	82.9	58	82.9	12	17.1	70	100.0	0	0.0	1.13	0.289
Perform suction procedure as needed	0	0.0	70	100.0	56	80.0	14	20.0	70	100.0	0	0.0	1.56	0.212

Table (3: A-2) showed that the highest compliance (100.0%) was observed in informing patients about the reason of oxygen therapy and administering oxygen therapy as prescribed by doctor order across all three observations. While, NO compliance (0.0%) was found in performing suction procedure as needed during the first observation. no statistically significant differences were found across the three observations for all items ($p > 0.05$), indicating that the improvements were not statistically significant.

Table 3: A-3 Observed Nurses' Performance In Compliance With KPI Regarding Intravenous Line (N=70) With 210 Observations

Intravenous line	First observation		Second observation				Third observation						X2		P
	Done	Not done	done		Not done	done					Not done				
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%			
Follow aseptic technique when inserting of intravenous Cannula as needed	70	100.0	0	0.0	70	100.0	0	0.0	70	100.0	0	0.0	0.00	1.000	
Monitoring of Cannula site for proper function	70	100.0	0	0.0	70	100.0	0	0.0	70	100.0	0	0.0	0.00	1.000	
Recording the date of insertion and date of dressing over the Cannula insertion site	58	82.9	12	17.1	58	82.9	12	17.1	70	100.0	0	0.0	1.13	0.289	
Assess the site of Cannula for any abnormalities	46	65.7	24	34.3	47	67.1	23	32.9	70	100.0	0	0.0	4.52	0.033*	
Monitoring of central venous line for proper placement and function	0	0.0	70	100.0	49	70.0	21	30.0	70	100.0	0	0.0	3.71	0.054	
Follow aseptic technique when measuring the central venous pressure	0	0.0	70	100.0	51	72.9	19	27.1	70	100.0	0	0.0	2.98	0.084	
Recording the date of insertion and date of dressing over the central venous line insertion site	70	100.0	0	0.0	70	100.0	0	0.0	70	100.0	0	0.0	0.00	1.000	
All intravenous lines are properly closed after finishing nursing procedure	70	100.0	0	0.0	70	100.0	0	0.0	70	100.0	0	0.0	0.00	1.000	
Correct intravenous fluids with precise labeling were administered at proper rates	70	100.0	0	0.0	70	100.0	0	0.0	70	100.0	0	0.0	0.00	1.000	
Recording any patient connections with time	58	82.9	12	17.1	58	82.9	12	17.1	70	100.0	0	0.0	1.13	0.289	

Table (3: A-3) he table shows that nurses had a high level of compliance with the KPI related to oxygen and ventilation. All nurses (100%) informed patients about the reason for oxygen therapy and administered oxygen therapy according to the doctor's order in all three observations. Compliance with encouraging patients to cough and take deep breaths and assessing patients on invasive mechanical ventilation increased from 82.9% in the first and second observations to 100% in the third observation. Similarly, compliance with endotracheal tube care increased from 17.1% in the first observation to 82.9% in the second and 100% in the third observation. Suction procedure compliance also improved from 0% in the first observation to 80% in the second and 100% in the third observation. However, these differences were not statistically significant, as all P values were greater than 0.05.

Table 3: A- 4 Observed Nurses' Performance In Compliance With KPI Regarding Arterial Line Care (N=70) With 210 Observations

Arterial line care	First observation				Second observation				Third observation				X2	P
	Done		Not done		Done		Not done		done		Not done			
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%		
Record the procedure, outcome and plan in the progress note	70	100.0	0	0.0	70	100.0	0	0.0	70	100.0	0	0.0	0.00	1.000
Observe the limb, distal to the insertion site for warmth, sensation, color and pulses if applicable.	70	100.0	0	0.0	70	100.0	0	0.0	70	100.0	0	0.0	0.00	1.000
observation patient fluid balance chart	12	17.1	58	82.9	39	55.7	31	44.3	70	100.0	0	0.0	8.82	0.003*
Status of the cannulation site and limb distal to the insertion site.	0	0.0	70	100.0	25	35.7	45	64.3	70	100.0	0	0.0	21.32	0.000*
Monitor the continuous flush system one to four hourly to maintain pressure level at 300mmHg.	12	17.1	58	82.9	31	44.3	39	55.7	70	100.0	0	0.0	15.06	0.000*

Table (3: A-4) shows that nurses had a high level of compliance with the KPI related to arterial line care. All nurses (100%) recorded the procedure, outcome, and plan in the progress note and observed the limb distal to the insertion site for warmth, sensation, color, and pulses, when applicable, in all three observations, with no statistically significant differences ($P=1.000$). Compliance with observing the patient's fluid balance chart increased from 17.1% in the first observation to 55.7% in the second and reached 100% in the third observation, showing a statistically significant improvement ($\chi^2=8.82$, $P=0.003$). Similarly, compliance with assessing the status of the cannulation site and the limb distal to the insertion site increased from 0% in the first observation to 35.7% in the second and 100% in the third observation, with a statistically significant difference ($\chi^2=21.32$, $P<0.001$). In addition, compliance with monitoring the continuous flush system every one to four hours to maintain the pressure level at 300 mmHg improved from 17.1% in the first observation to 44.3% in the second and 100% in the third observation, with a statistically significant difference ($\chi^2=15.06$, $P<0.001$). Overall, the findings indicate a marked improvement in nurses' compliance with arterial line care practices across the three observations, with most items reaching 100% compliance in the third observation.

Table 4: (Expert Opinionnaire Results, N = 15)

Item No.	Proposed Key Nursing Performance Indicator	Agree without Comment		Agree with Comment		Disagree	
		(n)	(%)	(n)	(%)	(n)	(%)
1	The indicators clearly reveal the Key Nursing Performance Indicators.	14	93.3	1	6.7	0	0.0
2	The indicators are applicable.	12	80.0	3	20.0	0	0.0
3	The indicators are relevant to the title of the study.	15	100.0	0	0.0	0	0.0

4	The indicators are clear.	14	93.3	1	6.7	0	0.0
5	The indicators are understandable.	13	86.7	2	13.3	0	0.0
6	The indicators are specifically related to the title of the study.	15	100.0	0	0.0	0	0.0
7	The indicators include representative items under each dimension.	13	86.7	2	13.3	0	0.0
8	The indicators are designed in a logical sequence.	13	86.7	2	13.3	0	0.0

Table (4) illustrates the distribution of expert opinions regarding the proposed Key Nursing Performance Indicators (KNPIs) for Intensive Care Units (ICUs). The findings revealed an exceptionally high level of agreement among the 15 experts, with an overall agreement rate of 100% for all items and no reported disagreement.

Items 3 and 6 achieved the highest level of consensus, as all experts (100%) agreed without comments. This indicates complete acceptance of these items and reflects their clarity, relevance, and applicability to the study objectives.

Items 1 and 4 received 93.3% agreement without comments and 6.7% agreement with comments. Although a small proportion of experts suggested minor modifications, all experts supported the inclusion of these items, demonstrating their suitability and importance.

Items 5, 7, and 8 showed 86.7% agreement without comments and 13.3% agreement with comments. These results suggest that while some experts provided recommendations for refinement, there was unanimous agreement regarding the relevance and appropriateness of these items. Item 2 had the lowest percentage of agreement without comments (80.0%), whereas 20.0% of experts agreed with comments. Nevertheless, the item achieved an overall agreement rate of 100%, indicating that it was considered acceptable and valid by all experts after considering suggested improvements. Overall, the results demonstrate strong expert consensus and provide substantial evidence for the content validity of the proposed Key Nursing Performance Indicators for Intensive Care Units. The indicators were judged to be clear, understandable, relevant, applicable, representative of the study dimensions, and logically organized, supporting their use in evaluating nursing performance within ICU settings.

DISCUSSION

Key Nursing Performance Indicators (KNPIs) are measurable indicators used to evaluate the quality, safety, and effectiveness of nursing care. Recent literature emphasizes that nursing-sensitive indicators should reflect nursing practice and provide meaningful information for monitoring and improving care quality. In critical care, KNPIs can support systematic evaluation of nursing practice and identify areas requiring improvement (Gormley et al., 2024).

Nursing performance reflects nurses' ability to apply their knowledge, clinical skills, judgment, and professional competencies to provide safe and effective patient care. High nursing performance is essential for maintaining quality of care and patient safety,

particularly in complex clinical settings. Recent evidence indicates that nurses' competency is influenced by education, clinical training, experience, critical thinking, and the practice environment **(Almarwani & Alzahrani, 2023)**.

The data presented in the current study indicate that most of the studied nurses were aged from 30 to less than 45 years, married, female, and held a Technical Diploma in Nursing. Most nurses had considerable nursing experience, with 42.9% having 10 to less than 15 years of experience. Of particular importance, all studied nurses reported having received no training in quality performance and management **(Oner et al., 2025)**.

In agreement with the present study, recent evidence has emphasized that nurses' professional preparation, clinical experience, workload, and working environment are important factors influencing nursing performance and quality of care, particularly in intensive care settings **(Oner et al., 2025)**.

In disagreement with the present study, recent literature indicates that demographic characteristics such as age, gender, and educational level alone cannot determine the quality of nursing performance. Nursing performance is influenced by several professional and organizational factors, including staffing, workload, competency, and the clinical environment **(Elmdni et al., 2025)**.

From the researcher interpretation the most important finding in this table is the complete absence of training in quality performance and management. Although the nurses had considerable clinical experience, the lack of formal quality training may limit their ability to systematically assess and improve nursing performance using KNPIs.

The findings of the present study demonstrated that more than half of the studied nurses reported the absence of a clear hospital vision, objectives, core values, policies, procedures, announcement, and annual updating system related to KPIs. In contrast, 65.7% reported that daily work tasks and schedules were clearly assigned, indicating better organization of routine nursing activities than formal KPI implementation **(Barrenetxea et al., 2025)**.

In agreement with the present study, recent research has emphasized that ICU nursing quality indicators should be clearly defined and incorporated into organized quality-improvement systems. The use of structured indicators helps healthcare organizations monitor nursing performance and identify areas requiring improvement **(Barrenetxea et al., 2025)**.

In disagreement with the present study, recent evidence supports adequate nurse staffing as an important factor in improving ICU patient safety and outcomes. However, the evidence does not support applying one fixed nurse-patient ratio to all patients because staffing requirements may differ according to patient acuity, workload, and nurses' competencies **(Elmdni et al., 2025)**.

The researcher point of views absence of formal KPI structures represents an important organizational weakness. Nurses may perform their daily duties appropriately while lacking a systematic method for determining whether their performance meets

established quality standards. Therefore, KNPIs should be clearly defined, communicated, regularly updated, and incorporated into the hospital quality-management system.

The findings of the present study showed 100% compliance with maintaining the head of the bed at 30 degrees throughout the three observations. DVT prophylaxis showed progressive improvement from 17.1% in the first observation to 35.7% in the second and 64.3% in the third observation. Daily oral care with chlorhexidine also improved from 34.3% to 65.7% and then 100%, with a statistically significant difference (**Cellura et al., 2026**).

In agreement with the present study, recent research supports the use of standardized nursing-sensitive indicators to monitor specific nursing practices in intensive care units. Such indicators provide measurable information that can be used to identify deficiencies and support continuous improvement in nursing care (**Cellura et al., 2026**).

In disagreement with the present study, recent evidence suggests that individual components of quality indicators may differ in their relationship with patient outcomes. Therefore, increased compliance with a specific ventilator-care practice should not necessarily be interpreted as evidence that all components have the same clinical effect (**Cellura et al., 2026**).

From The researcher interpretation that the progressive improvement in ventilator-bundle compliance reflects the importance of repeated observation and reinforcement of nursing practice. The initial low compliance with some components indicates that these practices may be overlooked during routine care, whereas continuous monitoring can improve nurses' attention to established performance standards.

The findings of the present study showed 100% compliance with informing patients about the reason for oxygen therapy and administering oxygen according to medical orders throughout the three observations. Endotracheal tube care improved from 17.1% of nurses in the first observation to 82.9% of nurses in the second and 100% of nurses in the third, while suctioning improved from 0% to 80% of nurses and then 100% of nurses, although the differences were not statistically significant (**Cellura et al., 2026**).

In agreement with the present study, recent ICU nursing research emphasizes the importance of structured respiratory-care practices and measurable indicators for evaluating the quality of nursing care provided to mechanically ventilated patients (**Cellura et al., 2026**).

In disagreement with the present study, recent quality-improvement research has demonstrated that structured monitoring and implementation of ventilator-care practices can produce significant improvements in nursing compliance and clinical outcomes. The absence of statistical significance in the present study may be related to the relatively small sample and the high level of performance reached during the third observation (**Barrenetxea et al., 2025**).

From the point of view of the researcher the improvement from very low initial compliance with suctioning and endotracheal tube care to complete compliance in the third observation is clinically important despite the absence of statistical significance. This improvement may indicate that repeated observation and reinforcement positively influenced nurses' performance.

The findings of the present study demonstrated high compliance with several intravenous-line care practices. Aseptic technique during IV cannula insertion and monitoring of cannula-site function achieved 100% compliance throughout the observations. Assessment of the cannula site for abnormalities improved from 65.7% to 67.1% and then 100%, with a statistically significant difference (Yu et al., 2025).

In agreement with the present study, recent research has emphasized the importance of structured nursing quality indicators for assessing specific clinical practices and monitoring the quality and safety of nursing care. Such indicators can help identify areas requiring improvement and support continuous monitoring of nursing performance (Yu et al., 2025).

In disagreement with the present study, recent evidence indicates that compliance with nursing practices may vary between clinical settings according to institutional policies, available resources, nurses' competencies, and monitoring systems. Therefore, high compliance observed in the present study may not necessarily be representative of all intensive care settings (Cellura et al., 2026).

From the point of view of the researcher the high compliance with intravenous-line care may be related to the structured nature of these procedures and their frequent integration into routine ICU nursing practice. The significant improvement in cannula-site assessment also suggests that repeated observation may increase nurses' attention to practices that could otherwise be overlooked.

The findings of the present study demonstrated substantial improvement in arterial-line care across the three observations. Monitoring the patient's fluid-balance chart increased from 17.1% to 55.7% and then 100%, while assessment of the cannulation site and distal limb increased from 0% to 35.7% and then 100%. Monitoring of the continuous flush system also increased from 17.1% to 44.3% and then 100%, with statistically significant differences (Yu et al., 2025).

In agreement with the present study, recent research has demonstrated the value of structured nursing quality indicators based on the Donabedian framework for evaluating and improving specialized nursing practices. These indicators provide a systematic approach for monitoring nursing performance and supporting quality improvement in critical care (Yu et al., 2025).

However the recent evidence indicates that the relevance and feasibility of individual nursing indicators may vary between settings and should therefore be periodically evaluated. This emphasizes that high compliance with an indicator during one period does not eliminate the need for continuous monitoring and validation (Cellura et al., 2026).

From the point of view of the researcher the arterial-line findings represent one of the strongest results of the present study. The marked improvement in fluid-balance monitoring, cannulation-site assessment, and continuous flush-system monitoring indicates that KNPIs can serve not only as measurement instruments but also as practical tools for improving nurses' attention to specific aspects of patient care.

The findings of the present study demonstrated 100% overall agreement among the 15 experts regarding all proposed KNPIs. Although some experts provided comments on individual items, no expert disagreed with any of the proposed indicators, indicating a high level of acceptance of the developed KNPIs (**Cellura et al., 2026**).

Regarding the result of experts opinion about KNPIs, In agreement with the present study, recent Delphi research has demonstrated that expert consensus is an effective approach for developing nursing-sensitive indicators for intensive care. Consensus-based indicators can provide a structured and measurable framework for evaluating nursing quality and supporting continuous quality improvement (**Cellura et al., 2026**).

In1 disagreement with the present study, recent Delphi studies have shown that complete agreement is not always achieved for all proposed indicators. Some indicators may require modification or exclusion when they do not meet predetermined levels of consensus, appropriateness, or feasibility (**Cellura et al., 2026**).

From the researcher interpretation 100% agreement obtained from the experts provides strong support for the acceptability and content validity of the proposed KNPIs. The comments provided by some experts should be considered constructive suggestions for refinement and adaptation rather than disagreement.

CONCLUSION

The presents study concluded to developing a proposed, valid key nursing performance indicators for ICUs in NHI for structure (vision, mission, policies &communication). For process (ventilator bundle, Oxygen and ventilation and arterial-line care).

The studied ICU nurses had considerable clinical experience; however, all studied nurses reported the absence of training in quality performance and management. Nurses' perception also revealed deficiencies in the formal institutionalization of Key Nursing Performance Indicators, particularly regarding hospital vision, objectives, policies, procedures, communication, and updating of KPIs, arterial-line care.

The observational findings demonstrated variable levels of compliance across different nursing-care domains. Ventilator-bundle compliance improved across observations, with statistically significant improvements in DVT prophylaxis and daily oral care. Oxygen and ventilation practices also demonstrated marked clinical improvement, although these changes were not statistically significant. Intravenous-line care demonstrated generally high compliance, while arterial-line care showed particularly marked and statistically significant improvements in fluid-balance monitoring, cannulation-site assessment, and continuous-flush-system monitoring.

Overall, validity of the proposed KNPI was evident by total acceptance with 100% overall agreement, supporting their relevance, applicability, clarity, understandability, and representation of the study dimensions.

Recommendations

Based on the findings obtained from the present study, the following recommendations are deduced.

- Adopt the developed valid and approved Key Nursing Performance Indicator in ICUs of NHI.
- Integrate the proposed KNPIs into the hospital's quality-management system and ensure that they are clearly communicated to all ICU nursing staff.
- Provide regular training programs for ICU nurses on quality performance, KPI concepts, data collection, interpretation, and quality-improvement methods, particularly in view of the finding that 100% of the studied nurses had not received quality training.
- Establish a feedback mechanism through which nurses receive the results of KPI audits and are informed about areas requiring improvement.
- Repeat KPI measurements periodically to determine whether improvements are sustained over time rather than being limited to the observation period.
- Use the proposed KNPIs as a quality-improvement instrument rather than solely as an evaluation tool, linking KPI results with education, corrective action, and follow-up.
- Consider patient acuity and nursing workload when determining nurse-patient staffing, rather than applying a single fixed ratio to every ICU patient.
- Conduct further studies on larger samples and in different ICU settings to establish the reliability, feasibility, and generalizability of the proposed KNPIs.

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